

S Series Switch Cisco HSRP Replacement

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About This Document

Purpose

This document describes the differences between Cisco HSRP and Huawei VRRP, and provides the configuration procedure in HSRP networking.





Intended Audience


This document is intended for:

- Network planning engineers
- Commissioning engineers
- Data configuration engineers
- Onsite maintenance engineers
- Network monitoring engineers
- System maintenance engineers

Symbol Conventions

The symbols that may be found in this document are defined as follows.

Symbol	Description
 DANGER	Alerts you to a high risk hazard that could, if not avoided, result in serious injury or death.
 WARNING	Alerts you to a medium or low risk hazard that could, if not avoided, result in moderate or minor injury.
 CAUTION	Alerts you to a potentially hazardous situation that could, if not avoided, result in equipment damage, data loss, performance deterioration, or unanticipated results.
 TIP	Provides a tip that may help you solve a problem or save time.

Symbol	Description
 NOTE	Provides additional information to emphasize or supplement important points in the main text.

Change History

Changes between document issues are cumulative. The latest document issue contains all the changes made in earlier issues.

Issue 01 (2013-08-05)

This issue is the first official release.

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1 Overview

1.1 Cisco HSRP

The Hot Standby Router Protocol (HSRP) is a Cisco proprietary protocol.

Multiple routers constitute an HSRP group to simulate a virtual router (this virtual router has a virtual IP address and a virtual MAC address). In an HSRP group, only one router functions as the active router to send data packets. When the active router fails, a standby router is selected as the active router to forward traffic. For hosts, the virtual router remains unchanged.

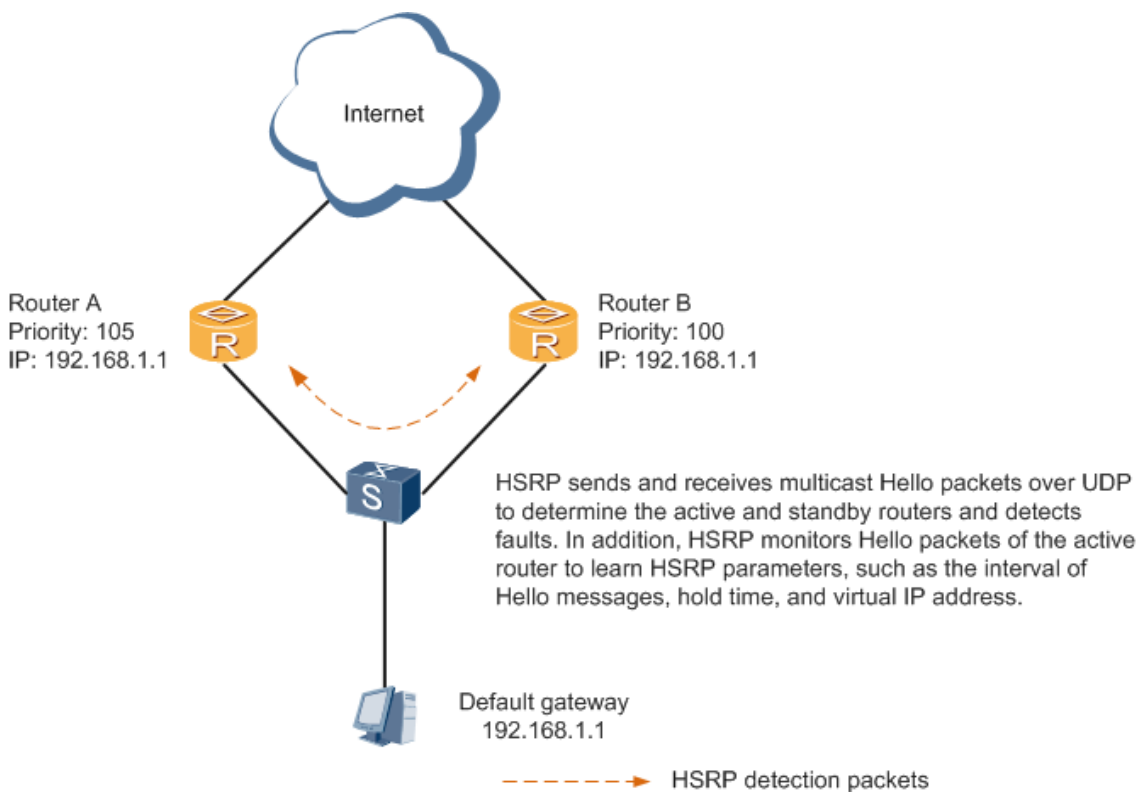
1.1.1 Implementation

As shown in Figure 1-1, RouterA and RouterB constitute an HSRP group. For hosts, the HSRP group functions as a virtual router that has a virtual IP address. Hosts use the virtual router as the gateway.

RouterA functions as the active router to forward data packets sent from the hosts, and RouterB functions as the standby router. When RouterA becomes faulty, RouterB replaces RouterA to forward data packets sent from hosts. The HSRP group implements link redundancy.

HSRP is designed for multicast- or broadcast-capable LANs (such as Ethernet networks).

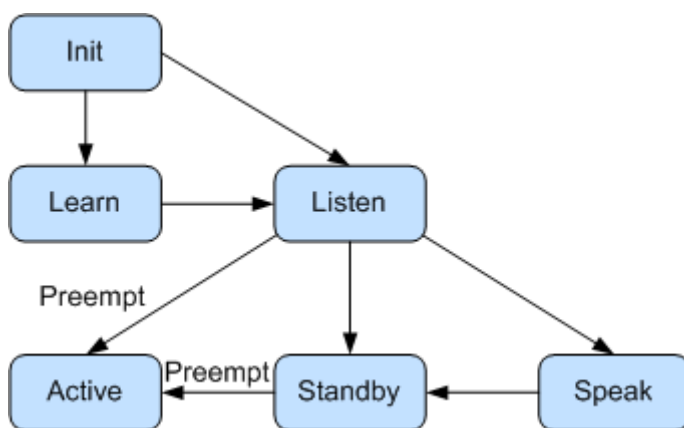
Figure 1-1 HSRP group



1.1.2 State Machine

Figure 1-2 shows HSRP state machine. HSRP has six states, which is more complex than VRRP. This is because VRRP has three states.

Figure 1-2 HSRP state machine



HSRP state machine is described as follows:

- **Init:** indicates that HSRP does not run. In Init state, HSRP is enabled first on one device of an HSRP group, an interface is just enabled, or the configuration is changed. When the HSRP group has no virtual IP address configured, the HSRP group is in Learn state. When the HSRP group has a virtual IP address configured, the HSRP group is in Listen state.
- **Learn:** indicates that the HSRP group has no virtual IP address configured. Members of the HSRP group monitor Hello packets sent by the active router and learn the virtual IP address from the Hello packets. After members learn the virtual IP address, the HSRP group enters the Listen state.
- **Listen:** indicates that the HSRP group has a virtual IP address configured or members learn the virtual IP address. Members in the HSRP group monitor Hello packets to learn the status of the active or standby router. If the members do not receive Hello packets from the active or standby router in the hold time, the HSRP group enters the speak state and election starts.
- **Speak:** indicates that members in the HSRP group start election of the active or standby router. The members send Hello packets to perform election.
- **Standby:** indicates the status of a standby router. The standby router monitors the status of the active router. When the active router fails, the standby router replaces the active router to forward traffic. The standby router periodically sends Hello packets to notify other members of its status.
- **Active:** indicates the status of the active router. The active router periodically sends Hello packets to notify other members of its status.

1.2 VRRP

The Virtual Router Redundancy Protocol (VRRP), defined by RFC 2338, provides the backup mechanism for devices on LANs.

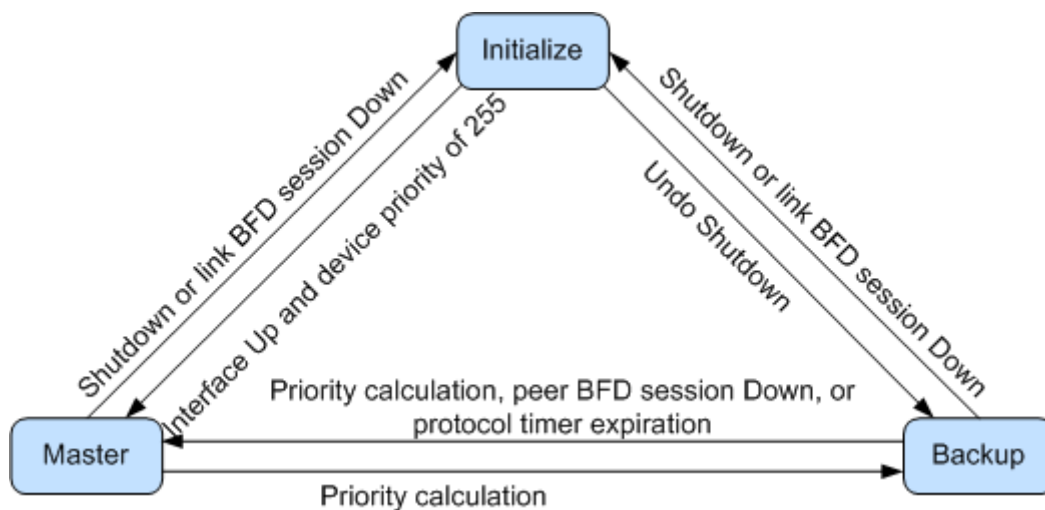
1.2.1 Implementation

The functions and implementations of VRRP and Cisco HSRP are similar.

1.2.2 State Machine

Figure 1-3 describes the VRRP state machine.

Figure 1-3 VRRP state machine



VRRP state machine is described as follows:

- Initialize: indicates the status of a VRRP-enabled interface in Down state. In Initialize state, the device does not process VRRP packets, forward traffic, or participate in election of the master and backup. After receiving an interface Up message, the VRRP-enabled device with priority 255 becomes the master and the VRRP-enabled device with its priority less than 255 switches to the Backup state.
- Master: indicates the status of the device that is responsible for forwarding gateway traffic and responding to ARP Request messages with the VRRP virtual IP address. In addition, the device in Master state periodically sends protocol packets with multicast address 224.0.0.18 to maintain the VRRP group status. The device becomes the backup if the device receives a packet with higher priority or if the device receives a VRRP packet with the same priority as itself and the IP address of the local interface is smaller than the IP address of the remote interface.
- Backup: indicates the status of a device that monitors heartbeat packets of the master. The device in Backup state does not forward traffic or respond to corresponding ARP Request messages. If the priority of the device changes or the device does not receive packets from the master in the Master_Down_Interval, the device switches to the master.

2 Replaceability Analysis

2.1 Replaceability

HSRP is a Cisco proprietary protocol and cannot communicate with devices from other vendors. The implementations of HSRP and VRRP are similar, so VRRP can replace Cisco HSRP.

2.2 Comparisons

Comparisons Between HSRP and VRRP

Protocol	HSRP	VRRP
Interworking	Cisco proprietary protocol that does not support interworking	Standard protocol that supports interworking
Preemption mode	Non-preemption by default	Preemption by default
State machine	Six states (complex)	Three states (simple)
System load	Heavy because packets are sent in Active and Standby states	Light because packets in Master state send packets
Fast switchover	Millisecond-level	BFD for VRRP
Route association	Route association	BFD for VRRP

Comparisons Between HSRP and VRRP Commands

Configuration	Cisco	Huawei
Virtual IP address	standby 1 ip 192.168.16.254	vrrp vrid 1 virtual-ip 192.168.16.254
Priority	standby 1 priority 120	vrrp vrid 1 priority 120

Configuration	Cisco	Huawei
Packet transmission interval	standby 1 timers 3 10	vrrp vrid 1 timer advertise 3
Authentication mode	standby 1 authentication md5 key-string cisco	vrrp vrid 1 authentication-mode md5/simple cisco
Interface association	standby 1 track fa0/10 20	vrrp vrid 1 track interface Ethernet0/0/10 reduced 20

Detailed Comparisons Between HSRP and VRRP Commands

- Cisco HSRP configuration

```

int vlan 1
standby 1 ip 192.168.16.254 //The virtual IP address of the HSRP group
must be the same.
standby 1 priority 120 //Specify the priority of HSRP group 1 on the
active router. A higher priority indicates higher probability of being the active
router.
standby 1 preempt //Configure the preemption mode. By default,
the non-preemption mode is used.
standby 1 timers 3 10 //Set the Hello time to 3s and hold time to 10s.
If Hello packets are not received after 10s, an active/standby switchover is
performed.
standby 1 authentication md5 key-string cisco
standby 1 track fa0/10 20 //Associate the HSRP group with an interface.

```

- VRRP configuration

```

interface Vlanif1
vrrp vrid 1 virtual-ip 192.168.16.254 //The virtual IP address
of the VRRP group must be the same.
vrrp vrid 1 priority 120 //Specify the priority of VRRP group 1 on the
master. A higher priority indicates higher probability of being the master.
vrrp vrid 1 timer advertise 3 //Set the Hello time to 3s and hold time to
9s. If Hello packets are not received after 9s, an active/standby switchover is
performed.
vrrp vrid 1 authentication-mode md5/simple //Configure an
authentication mode.
vrrp vrid 1 track interface Ethernet0/0/0 reduced 20 //Associate the VRRP group
with an interface.

```

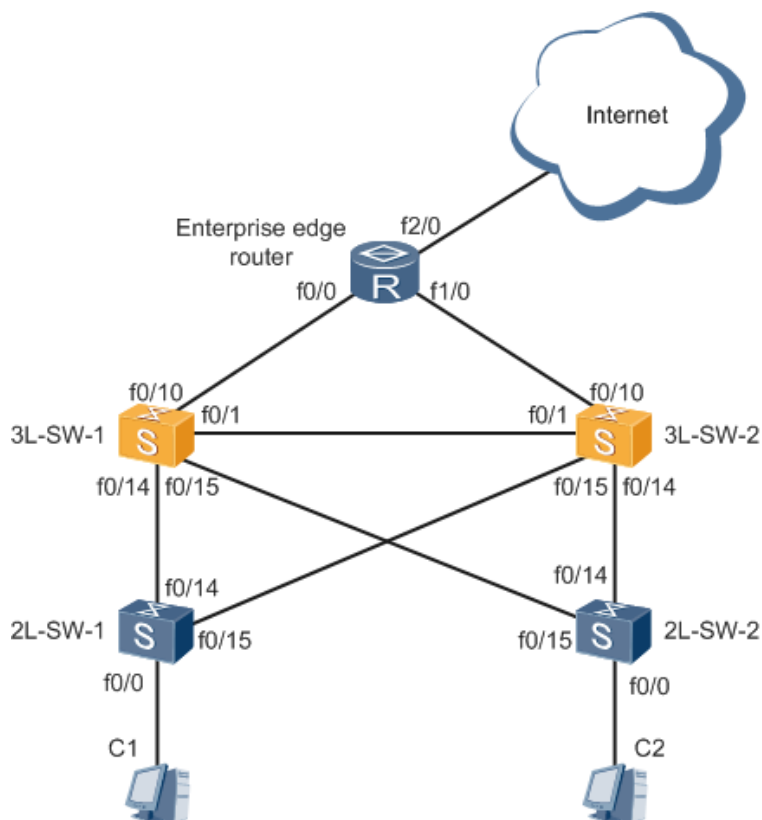
3 Example for Configuring HSRP

3.1 Configuring Cisco HSRP to Implement Gateway Backup

3.1.1 Network Topology

In Figure 3-1, 3L-SW-1 and 3L-SW-2 are core devices, and 2L-SW-1 and 2L-SW-2 are aggregation devices. f0/1, f0/14, and f0/15 of 3L-SW-1 and 3L-SW-2 join VLANs 1 to 15, and HSRP groups are configured on VLANIF 1 to VLANIF 15.

Figure 3-1 HSRP networking



3.1.2 Network Configuration

Configuration Requirements

Configure HSRP on Cisco switches to protect user traffic, and configure a loop prevention protocol to prevent loops.

Configuration Points

Plans VLANs and deploy HSRP in each VLAN on Cisco devices, and configure load balancing groups on 3L-SW-1 and 3L-SW-2.

Configuration Files

- # Configuration file of 3L-SW-1

```
configure terminal      //Configure VLANIF interfaces and assign IP addresses to
them.
interface vlan 1
ip address 192.168.16.1 255.255.255.0
interface vlan 2
ip address 10.177.155.1 255.255.255.0
interface vlan 3
ip address 172.16.2.1 255.255.255.0
interface vlan 4
ip address 172.16.3.1 255.255.255.0
interface vlan 5
ip address 172.16.4.1 255.255.255.0
end

configure terminal      //Configure a loop prevention protocol so that 3L-SW-1
becomes the root bridge in VLANs 1, 2, and 3.
spanning-tree vlan 1 root primary
spanning-tree vlan 2 root primary
spanning-tree vlan 3 root primary
spanning-tree vlan 4 root secondary
spanning-tree vlan 5 root secondary
end

configure terminal
interface range fastEthernet 0/1 , fastEthernet 0/14 , fastEthernet 0/15
switchport mode trunk
switchport trunk allowed vlan add 1,2,3,4,5
exit

interface vlan 1
standby 1 ip 192.168.16.254           //The virtual IP address of the HSRP group
must be the same.
standby 1 priority 120               //Specify the priority of HSRP group 1 on
the active router. A higher priority indicates higher probability of being the active
router.
standby 1 preempt                    //Configure the preemption mode. By
default, the non-preemption mode is used.
```

```
standby 1 timers 3 10 //Set the Hello time to 3s and hold time to 10s.
If Hello packets are not received after 10s, an active/standby switchover is
performed.
standby 1 authentication md5 key-string cisco
standby 1 track fastEthernet 0/10 20 //Associate the HSRP group with
an interface.
exit

interface vlan 2
standby 2 ip 10.177.155.254
standby 2 priority 120
standby 2 preempt
standby 2 timers 3 10
standby 2 authentication md5 key-string cisco
standby 2 track fastEthernet 0/10 20 //Associate the HSRP group with an
interface. When the link of fastEthernet 0/10 becomes faulty, the device priority
decreases by 20 so that its priority is lower than the priority of 3L-SW-2 (priority
110). Then 3L-SW-2 preempts to be the active router.
exit

interface vlan 3
standby 3 ip 172.16.2.254
standby 3 priority 120
standby 3 preempt
standby 3 timers 3 10
standby 3 authentication md5 key-string cisco
standby 3 track fastEthernet 0/10 20
exit

interface vlan 4
standby 4 ip 172.16.3.254
standby 4 priority 110
standby 4 preempt
standby 4 timers 3 10
standby 4 authentication md5 key-string cisco
exit

interface vlan 5
standby 5 ip 172.16.4.254
standby 5 priority 110
standby 5 preempt
standby 5 timers 3 10
standby 5 authentication md5 key-string cisco
exit
```

- # Configuration file of 3L-SW-2

```
configure terminal ///Configure VLANIF interfaces and assign IP addresses to
them.
interface vlan 1
ip address 192.168.16.2 255.255.255.0
interface vlan 2
ip address 10.177.155.2 255.255.255.0
interface vlan 3
ip address 172.16.2.2 255.255.255.0
interface vlan 4
ip address 172.16.3.2 255.255.255.0
```

```
interface vlan 5
ip address 172.16.4.2 255.255.255.0
end

configure terminal //Configure a loop prevention protocol so that 3L-SW-2
becomes the root bridge in VLANs 4 and 5.
spanning-tree vlan 1 root secondary
spanning-tree vlan 2 root secondary
spanning-tree vlan 3 root secondary
spanning-tree vlan 4 root primary
spanning-tree vlan 5 root primary
end

configure terminal
interface range fastEthernet 0/1 , fastEthernet 0/14 , fastEthernet 0/15
switchport mode trunk
switchport trunk allowed vlan add 1,2,3,4,5
exit

interface vlan 1
standby 1 ip 192.168.16.254 //The configuration is similar to that of
3L-SW-1.
standby 1 priority 110
standby 1 preempt
standby 1 timers 3 10
standby 1 authentication md5 key-string cisco
exit

interface vlan 2
standby 2 ip 10.177.155.254
standby 2 priority 110
standby 2 preempt
standby 2 timers 3 10
standby 2 authentication md5 key-string cisco
exit

interface vlan 3
standby 3 ip 172.16.2.254
standby 3 priority 110
standby 3 preempt
standby 3 timers 3 10
standby 3 authentication md5 key-string cisco
exit

interface vlan 4
standby 4 ip 172.16.3.254
standby 4 priority 120
standby 4 preempt
standby 4 timers 3 10
standby 4 authentication md5 key-string cisco
standby 4 track fastEthernet 0/10 20
exit

interface vlan 5
standby 5 ip 172.16.4.254
```

```
standby 5 priority 120
standby 5 preempt
standby 5 timers 3 10
standby 5 authentication md5 key-string cisco
standby 5 track fastEthernet 0/10 20
exit
```

- # HSRP group configuration on 3L-SW-1 and 3L-SW-2

```
3L-SW-1>enable
3L-SW-1#show standby brief
          P indicates configured to preempt.
          |
Interface  Grp  Pri P State   Active      Standby      Virtual IP
V11        1   120 P Active  local       192.168.16.2 192.168.16.254
V12        2   120 P Active  local       10.177.155.2 10.177.155.254
V13        3   120 P Active  local       172.16.2.2   172.16.2.254
V14        4   110 P Standby 172.16.3.2  local       172.16.3.254
V15        5   110 P Standby 172.16.4.2  local       172.16.4.254
3L-SW-1#
```

```
3L-SW-2>enable
3L-SW-2#show standby brief
          P indicates configured to preempt.
          |
Interface  Grp  Pri P State   Active      Standby      Virtual IP
V11        1   110 P Standby 192.168.16.1 local       192.168.16.254
V12        2   110 P Standby 10.177.155.1 local       10.177.155.254
V13        3   110 P Standby 172.16.2.1  local       172.16.2.254
V14        4   120 P Active  local       172.16.3.1  172.16.3.254
V15        5   120 P Active  local       172.16.4.1  172.16.4.254
3L-SW-2#
```

3.1.3 Configuration Notes

- It is recommended that Huawei use BFD for VRRP to replace millisecond-level transmission of Cisco HSRP.
- It is recommended that Huawei use BFD for VRRP to replace route association of Cisco HSRP.
- HSRP uses the non-preemption mode by default.

4 References

The following table lists the references of this document.

Document	Description	Remarks
RFC2281	Cisco Hot Standby Router Protocol (HSRP)	http://www.rfc-editor.org/info/rfc2281
RFC2338	Virtual Router Redundancy Protocol	http://www.rfc-editor.org/info/rfc2338